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THE EFFECT OF THE 1989 MOTORCYCLE HELMET LAW ON
MOTORCYCLE ACCIDENT DEATHS IN TEXAS

By

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By

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THESIS

Presented to the Faculty of The University of Texas

Health Science Center at Houston

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In Partial Fulfillment

Of the Requirements

For the Degree of

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SCHOOL OF PUBLIC HEALTH
Houston, Texas
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PREFACE

This study was undertaken in an effort to help convince the Texas State Legislature to reinstate the comprehensive motorcycle helmet law which they repealed September 1997. It was written in the form of a manuscript for submission to *Texas Medicine*.

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I wish to thank my professors and advisors for all of their support, advice, and wisdom. Specifically, I wish to thank Dr. Rogers for his tireless efforts to help me improve my paper and Dr Moore for his insights and ability to make the difficult seem so simple. I am also indebted to my wonderful wife, Jacquelyn, and sons, Craig and David, who put up with the many changes in our lifestyle caused by my disappearance into “my Ivory Tower” to accomplish this work.

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THE EFFECT OF THE 1989 MOTORCYCLE HELMET LAW ON MOTORCYCLE
ACCIDENT DEATHS IN TEXAS

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School of Public Health. 1998

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This study evaluates the effectiveness of the 1989 comprehensive motorcycle helmet law in Texas. Data from the Texas Department of Motor Vehicles and Bureau of Vital Statistics were compiled to determine the mortality rates for the six-year time periods before and after this law. The six-year average of yearly motorcycle accident-related deaths per 10,000 registered motorcycles was 11, and the trend of the yearly averages was increasing during the years before the comprehensive helmet law. After enactment of the helmet law, the six-year average was 8 and the yearly averages were decreasing. The risk of dying from a motorcycle crash was 27% less when there was a comprehensive motorcycle helmet law in the state of Texas. Had the pre-helmet law mortality rate continued past 1989, there would have been an estimated 648 additional deaths from motorcycle accidents in Texas, an 85% increase.

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The Effect of the 1989 Motorcycle Helmet Law on Motorcycle Accident Deaths in Texas

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Abstract

This study evaluates the effectiveness of the 1989 comprehensive motorcycle helmet law in Texas. Data from the Texas Department of Motor Vehicles and Bureau of Vital Statistics were compiled to determine the mortality rates for the six-year time periods before and after this law. The six-year average of yearly motorcycle accident-related deaths per 10,000 registered motorcycles was 11, and the trend of the yearly averages was increasing during the years before the comprehensive helmet law. After enactment of the helmet law, the six-year average was 8 and the yearly averages were decreasing. The risk of dying from a motorcycle crash was 27% less when there was a comprehensive motorcycle helmet law in the state of Texas. Had the pre-helmet law mortality rate continued past 1989, there would have been an estimated 648 additional deaths from motorcycle accidents in Texas, an 85% increase.

Keywords- Motorcycle Helmet, Helmet Law

Introduction

The death rate from motorcycle crashes nation wide is four times higher than for automobile crashes (1). Until September 1997, forty-seven states had some type of

motorcycle helmet legislation; twenty-five had motorcycle helmet laws for all riders (comprehensive) and twenty-two only required helmets for riders under age eighteen. Iowa, Illinois, and Colorado had no helmet laws.

The Texas legislature has changed its position on this issue four times in the last three decades. In 1967 the federal government tied the availability of federal highway funds to the passage of State Highway Safety Programs, requiring states to implement specific safety laws or lose federal highway money. Texas complied and enacted a comprehensive motorcycle helmet law. In 1976, Congress removed the financial penalty for not complying with the State Highway Safety Programs. One legislative session later, Texas amended the comprehensive motorcycle helmet law into a "minors only" motorcycle helmet law. In 1989, responding to an increase in taxpayer costs to treat injured motorcyclists (2), the Texas Legislature reinstated the comprehensive motorcycle helmet law.

In September 1997, the legislators were convinced to repeal the 1989 comprehensive motorcycle helmet law by the arguments of "individual freedom" and "personal responsibility" eloquently presented by motorcycle enthusiasts. Against the advice of the Texas Department of Public Health, the State Legislators voted to allow the motorcyclists to decide for themselves whether or not to wear helmets. The various decisions of the Texas Legislature have provided conditions suitable for a "natural experiment" to test the impact of the 1989 comprehensive motorcycle helmet law on saving lives.

Literature Review

Anti-Helmet Law Side

The issue of mandatory helmet laws is contentious. Anti-helmet law advocates want no government intrusion into their “right” to ride motorcycles without helmets. They organized into several “grass roots” organizations that were successful in challenging the Texas helmet law. One such group is the Helmet Law Defense League (HLDL), formed in 1992, in response to the 1992 California helmet law. The HLDL advocates the immediate repeal of all motorcycle helmet laws (3). The HLDL skillfully uses the Internet and passionately testifies at many public forums to promote their agenda. The HLDL promotes papers, from anti-helmet law advocates, which critically review many of the early studies that showed the benefit of motorcycle helmets (4). These publications claim that the pro-helmet law studies were biased and erroneous. The anti-helmet law authors state that the pro-helmet law studies fail to consider confounders, use faulty correlation analysis, and make unproven assumptions about the similarities of disparate cohorts to “prove” their hypotheses (5). These anti-helmet law advocates contend that when many pro-helmet law studies are adjusted for the presence of confounders, these studies actually show that not wearing helmets is safer (5). Other support, for the anti-helmet law contention that not wearing helmets may be safer, comes from studies that claim motorcycle helmets restrict the wearer’s vision and decrease their hearing acuity (6). The studies allege that these impairments diminish a helmeted rider’s situational awareness, causing accidents that the non-helmeted rider could have avoided (5).

Pro-Helmet Law Side

Public health advocates from across the country, in an effort to convince state legislatures to enact motorcycle helmet laws, have collected volumes of data on motorcycle injuries, fatalities, and hospital costs. A recent study done in Texas showed the impact of the 1989 motorcycle-helmet law during its first year by comparing accident data from before and after the law went into effect (2). This study documented that in the first year after the law went into effect, there was a decline of 13.1% in motorcycle operators with severe injuries, a decline of 12.3% in overall injuries to motorcycle operators, and a decline of 57% in head-related operator deaths. Studies done in other states have documented the compliance with motorcycle helmet laws. Kelly documented that 14.6% of all accident victims in Illinois, a state without a helmet law, wore helmets (7). In Colorado, another state without a helmet law, Gabella found that helmet use ranged from 15% to 43%, the uncertainty due to missing helmet data from accident reports (8). Lund, Williams and Womack found 99% compliance with the helmet law in Texas one year after it was enacted (9).

Recent studies done in California, Colorado, Maryland, Illinois, and New Mexico all show a very strong association between wearing a motorcycle helmet and sustaining less injuries in a motorcycle crash (1, 8, 10-12). These studies showed that when injured motorcyclists who did and did not wear helmets were compared, the helmeted riders had fewer severe injuries and operative procedures and spent less time in the ICU and hospital. This resulted in decreased health care costs to the states that had motorcycle helmet laws.

Methods and Results

Data from the Texas Departments of Health, Public Safety, Transportation, the Bureau of Vital Statistics, and the Commission on Alcohol and Drug Abuse were compiled and examined. Differences between motorcyclist accident data from the two six-year time periods, 1983-1988 and 1990-1996, were compared and contrasted. The relative risk of a fatal motorcycle accident for a registered motorcycle owner, calculated using the formula: $RR = (a/(a+b)) / (c/(c+d))$, was 1.3 times greater when there was no helmet law (Table 1). The death rate, calculated as the deaths per 10,000 registered motorcycles, during the helmet law years was 27% lower than during the pre-helmet law years: 8.28 to 11.28 (Tables 2a & 2b). The difference between the trends of the death rates of the two six-year periods is striking (Figure 1). The slope of the pre-helmet law death rate trend was positive, (increasing), while the slope of the helmet law death rate trend was negative, (decreasing).

The number of pre-helmet law motorcycle deaths was related to the number of registered motorcycles using linear regression (registrations as the independent variable and deaths as the dependant variable). The slope and y-intercept for this regression line were calculated and used to predict deaths after 1989 (Figure 2). The difference between the predicted and actual deaths suggests that if the death rate during the pre-helmet law years continued from 1990 to 1995, there would have been 648 more deaths, an increase of 85%.

A comparison of the rates of police reported motorcycle injuries and the rates of motorcycle-related deaths (Figure 3.) shows that, in general, the yearly rates of injuries parallels the yearly rates of deaths. The injury and death rates were compared instead of the

actual numbers to control for the differing numbers of motorcycles on the road from year to year. The injury rate from 1990 to 1995 averaged 269 per year and was a 30.8% decrease from the 1883 to 1988 injury rate average of 389 per year.

Data from the Texas Commission on Alcohol and Drug Abuse (Figure 4) show no difference in self-reported alcohol use or heavy alcohol use from 1983 to 1996. The Texas Department of Public Safety computes the yearly percentages of motorcycle injury accidents involving alcohol in Texas. These ranged from 13.3% to 18% with no significant differences between the years before and after the helmet law (13-19).

Table 1. Comparison of Total Deaths and Registrations in the six-year Periods Before and After the 1989 Helmet Law

Helmet Law	Total Deaths	Total Registered
No	1771	1592284
Yes	759	918167

Table 2a. Motorcycle Registrations, Deaths, and Death Rate for Texas 1983 – 1988.

Year	Registered Motorcycles	Deaths	Deaths /10,000 Registered Motorcycles (Death Rate)
1983	322989	299	9.3
1984	309015	323	10.5
1985	277551	329	11.9
1986	248715	316	12.7
1987	226038	251	11.1
1988	207976	253	12.2
Totals	1592284	1771	Average Death Rate = 11.28

Table 2b. Motorcycle Registrations, Deaths, and Death Rate for Texas 1990 – 1995.

Year	Registered Motorcycles	Deaths	Deaths /10,000 Registered Motorcycles (Death Rate)
1990	170642	184	10.8
1991	180241	120	6.7
1992	159268	113	7.1
1993	139092	125	9.0
1994	137412	109	7.9
1995	131512	108	8.2
Totals	918167	759	Average Death Rate = 8.28

Figure 1 Pre- and Post- Helmet Law Death Rates and Trends

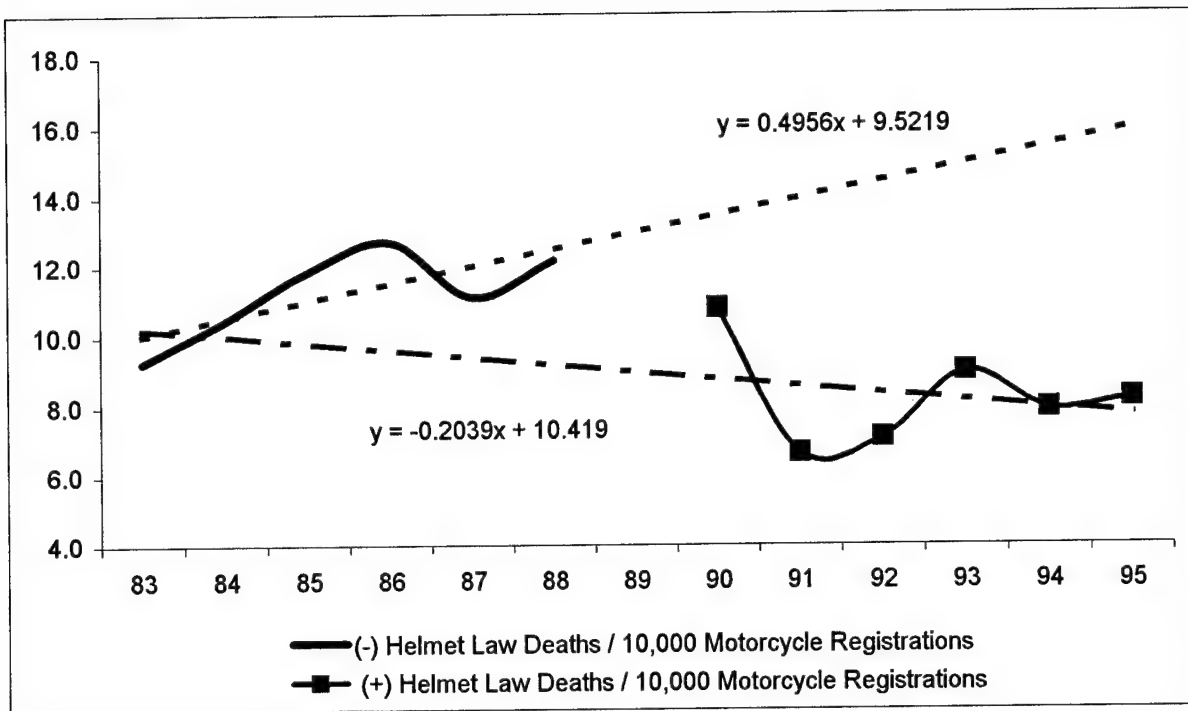


Figure 2. Predicted Deaths Compared to Actual Deaths and Motorcycle Registrations

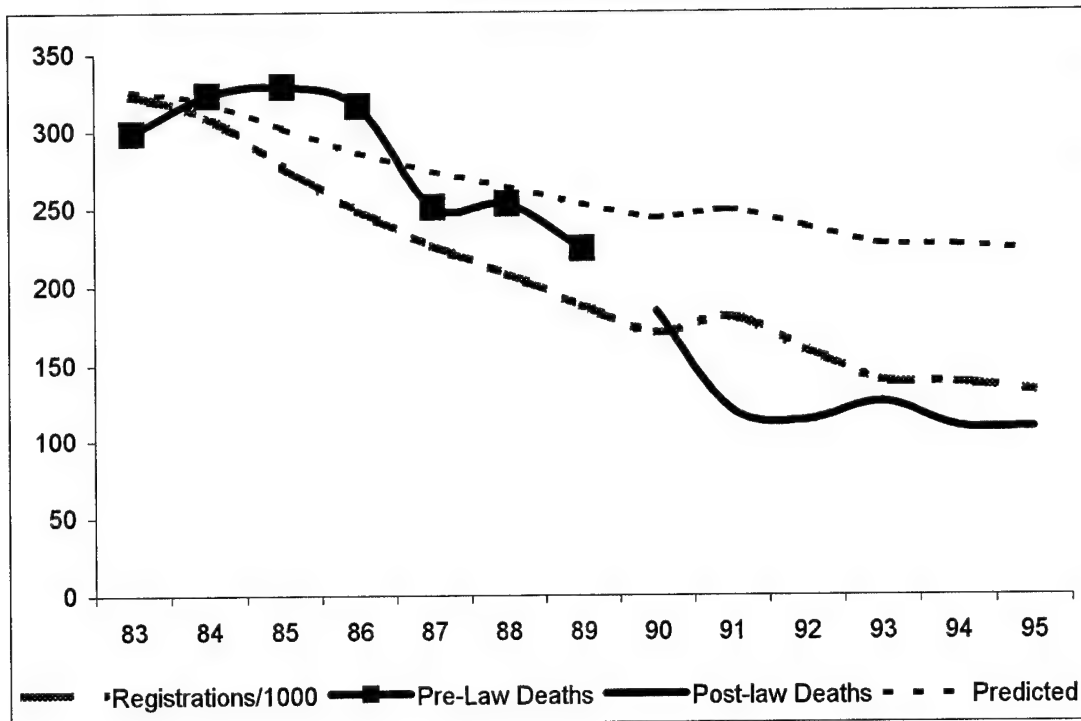


Figure 3. Comparison of Injury Rates & Death Rates

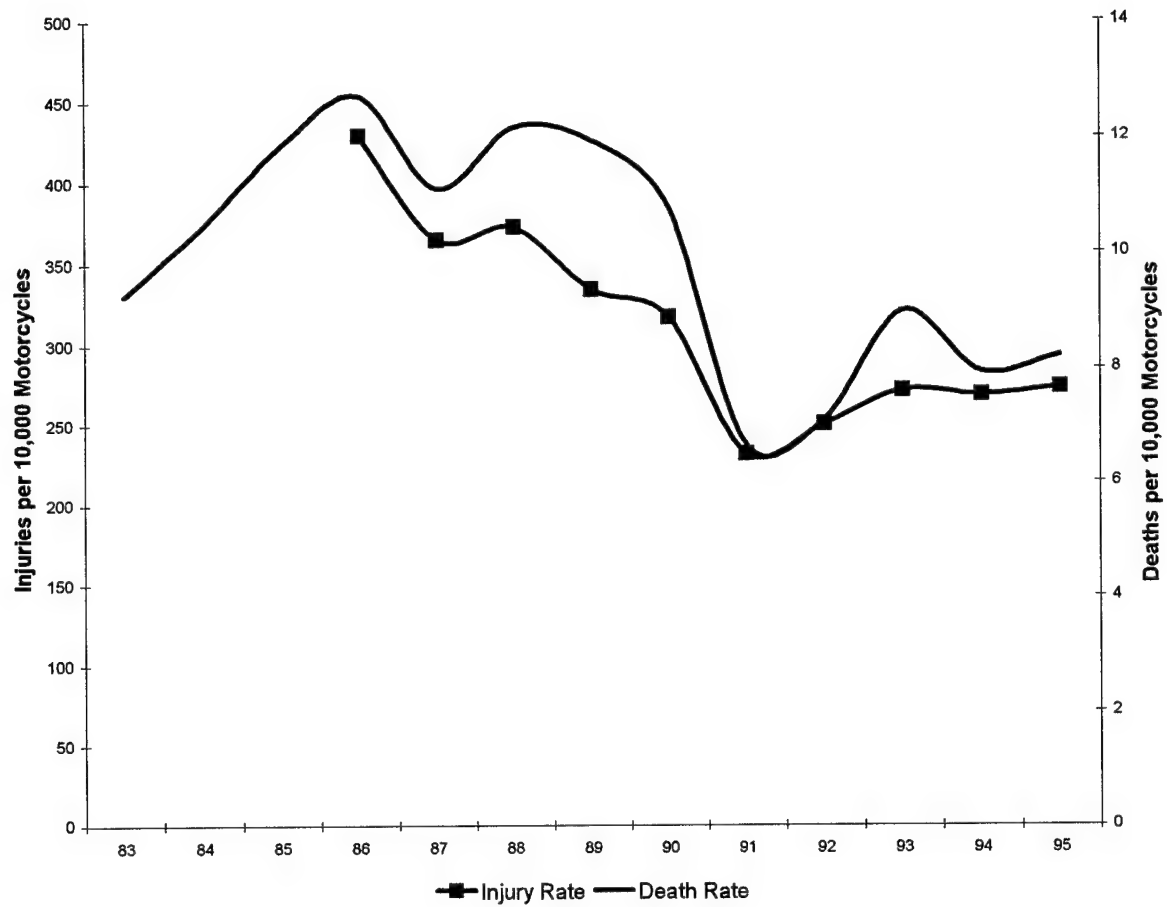
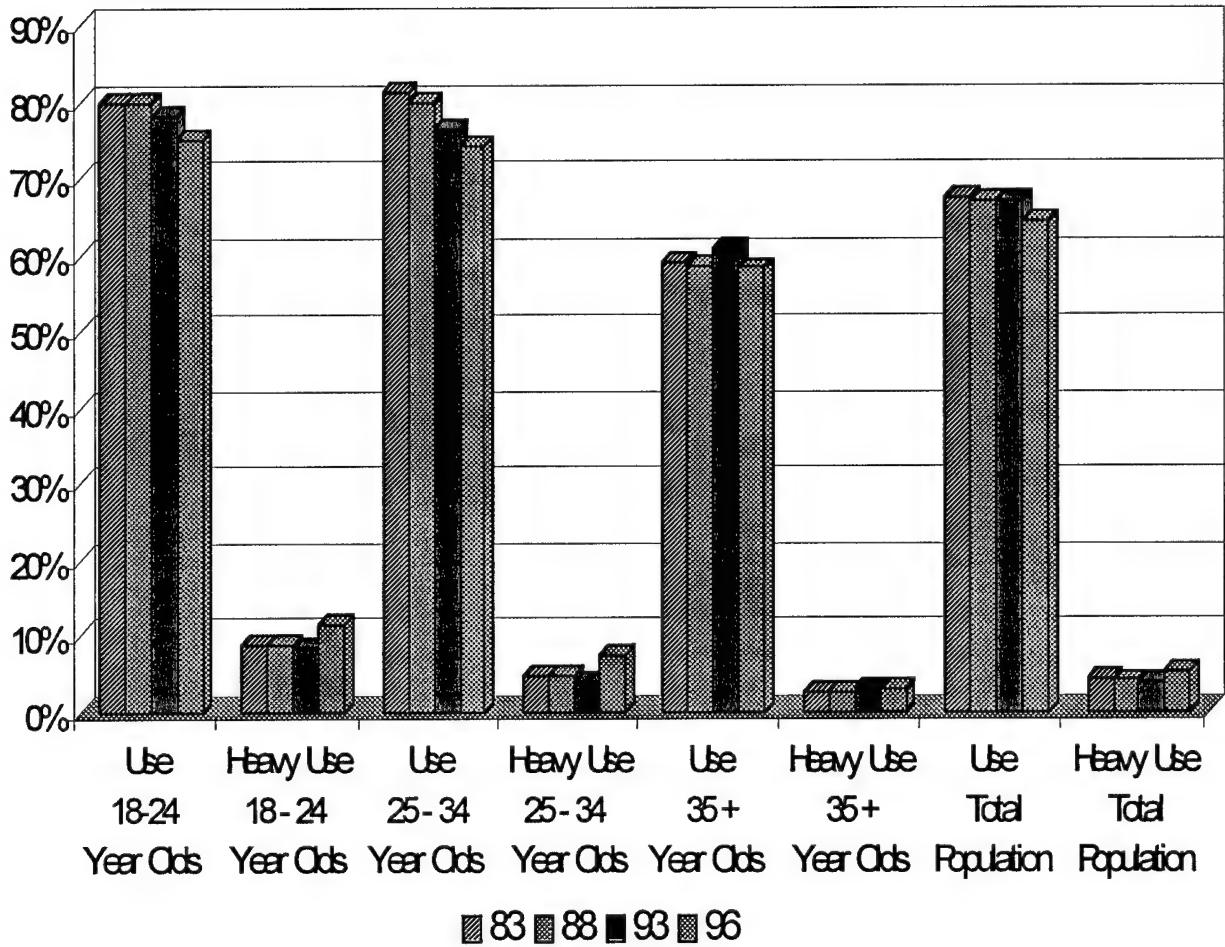


Figure 4. Self-reported alcohol use data from 1983 - 1996



Discussion

Did the 1989 comprehensive motorcycle helmet law save lives? The comparison of data gathered from six years before and after 1989 shows that the average mortality rate dropped 27%, from 11 to 8, and the average injury rate dropped 31%, from 389 to 269, after the law went into effect. If the increasing trend in the mortality rate for motorcyclists in the State of Texas had not been curtailed after the enactment of the 1989 comprehensive motorcycle helmet law, there would have been 648 more lives lost from motorcycle accidents between 1990 and 1995. These results suggest a strong association between the presence of the law and a decrease in the mortality and injury rates for motorcyclists

Alternative Explanations

As with any naturally occurring experiment that relies on observational data there is an assumption that the two groups being compared are equal except for the factor being tested. In this study, there were real and potential differences between the pre- and post-helmet law groups, other than the motorcycle helmet law, that may have accounted for the observed results. There was a 42% difference in the number of registered motorcycles between the groups. The smaller number of motorcycles in the post-helmet law group implies less total aggregate miles driven after the helmet law was in effect. This reduction in exposure could explain the dramatic decreases in the raw numbers of injuries and deaths in the years after 1990. Since there are no data for the miles driven by motorcycles per year, the number of registered motorcycles was used to adjust for the disparity between the two groups. Dividing motorcycle fatalities and injuries by the number of registered motorcycles

gave the rates for each group, which could then be reasonably compared. The possibility of significant differences between the two groups in miles driven per motorcycle exists but is remote. A significant difference in miles driven per motorcycle would imply a dramatic change in social, political, or economic factors as its cause. No such dramatic events occurred during the years of this study.

Alcohol is a major risk factor for motorcycle accidents. It can be discounted as an alternative explanation for the lower injury and mortality rates after 1990. Data from the Texas Commission on Alcohol and Drug Abuse showed that the self reported heavy and regular use of alcohol remained constant. Data from Texas Department of Public Safety showed no large differences in the amount of alcohol related motorcycle accidents from 1983 onwards.

Other significant differences between the two groups besides the presence of the helmet law are the increase in the legal speed limit and the increasing Texas population after 1990. Both of these may have caused more fatal accidents in the helmet law years and thus diminished the protective effect of the helmet law on the mortality and injury rates.

As previously documented, there is a greater than 95% compliance with helmet laws and less than 30% of riders use helmets when there is no law. Therefore, it is logical to infer that the lower fatality rate during the years with the comprehensive helmet law is due to more motorcyclists wearing helmets. This implies that motorcycle helmets save lives, though not necessarily by providing physical protection of the head. In Texas, the motorcycle helmet, with its mandatory reflectors, may have served to make the rider more visible, thus less likely to be involved in a fatal accident. Alternatively, wearing a helmet might lower the enjoyment

of the thrill-seeking motorcyclist who is more prone to fatal accidents. The decreased enjoyment could result in fewer miles driven. A third explanation, that wearing a motorcycle helmet might make the rider more safety conscious, is also a possibility. Any or all of these helmet effects would create a "safer" more risk-adverse group of motorcyclists, less likely to be involved in fatal motorcycle accidents.

Conclusions

With the passage of the 1989 comprehensive motorcycle helmet law, the Texas legislature set up a natural experiment by dividing motorcyclists into two groups. The first group, the pre-helmet law group, consisted of all Texas motorcyclists from 1983 to 1988. The second group, the post-helmet law group, consisted of all Texas motorcyclists from 1990 to 1995. The motorcyclists in the post-helmet law group had 57% fewer motorcycle-related deaths. They also had a 28% lower death rate, which was calculated to adjust for the smaller size of their group. The decrease in the death rate occurred despite the increase in the legal speed limit to 70 miles per hour. A continuation of the pre-law death rate would have resulted in additional 648 deaths, an increase of 85%.

Differences between the two groups in this study were examined. The most significant difference was the increase in motorcycle helmet use from approximately 25%, before 1989, to nearly 100% after the helmet law was enacted. Other differences between the pre- and post-helmet law groups were examined but none appeared as overwhelmingly significant as the difference in helmet use. The most logical and reasonable conclusion to this data is that the 1989 Texas comprehensive motorcycle helmet law saved lives by increasing the use of motorcycle helmets. Whether motorcycle helmet wear produced a lower death rate through physical protection, increased visibility (hence accident avoidance), or by a psychological safer driver effect, are questions for another study. The findings of this and other studies suggest that a significant enough association exists, between motorcycle helmet wear and fewer motorcycle accident deaths, to merit the reinstatement of the comprehensive motorcycle helmet law in Texas.

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